

examinations in physical geography. Grants in aid of teaching were made for successful candidates by each Department; but it was found that many pupil teachers presented themselves for examination by the Department of Science and Art after they had passed the examination of the Education Department, and they thus earned grants twice over for the same subject. To avoid this duplication, it was decided to limit physical geography to the Education Department, and to give the subject under the Department of Science and Art a wider scope and call it physiography. The subject was instituted in place of physical geography by a minute of the Lords of Committee of Council on Education dated August 15, 1876, and the first examination was held in the following year, the syllabus having been drawn up by Sir Norman Lockyer. The deliberate purpose was to introduce a subject which was not physical geography at all, and to prevent candidates with a knowledge of physical geography only from scoring a success upon their knowledge in the examinations in physiography. If this is remembered, the unreasonableness of criticising the physiography of the Department of Science and Art from the point of view of the physical geographer is at once obvious. There is nothing to justify the occupation of this position, and the comparison made from it has no significance.

The general impression is that Huxley first used the word physiography in the sense in which latter-day advocates of physical geography like to understand it. Prof. Davis commits himself to this opinion in the remark that "the term physiography has been adopted [by the South Kensington authorities] because of Huxley's use of it as a title for a series of lectures in 1869 and 1870." Now, as a matter of fact, this statement is not correct. The subject of the lectures was, as Huxley's disciples know, the Thames and its basin; and when the lectures were published eight years later, some elementary information was added on the movements of the earth and the constitution of the sun, and the title of "Physiography" was given to the book thus brought into existence. This Huxley clearly stated in the preface to his inspiring volume, and he also remarked "I borrowed the title of physiography," but that is usually overlooked. In the interval between the delivery of the lectures and their publication, physiography was adopted by the Department of Science and Art as a subject for examination, and what Huxley really did was to give his book the title of the new subject. The same title—physiography—was used by Prof. Ansted for a book published shortly before Huxley's work.

It therefore appears that there is no justification for fathering the term physiography upon Huxley, or for using the contents of his book "Physiography" as an affidavit testifying to the devolution which the subject has undergone on account of the South Kensington examinations. An acquaintance with the actual circumstances which caused the introduction of the subject and the adoption of its title by Huxley would have enabled Prof. Davis to see the matter in a little better light than that in which he wrote his criticism.

It is, however, not the object here merely to show the weak points of a criticism; that is, after all, a small matter in comparison with the meaning which should be attached to the word physiography. Etymologically considered, physiography is the science which is concerned with the facts and phenomena of the whole of nature, and therefore embraces all the natural and physical sciences. The separate sciences have had their fields of activity staked out, and work is continuously carried on in them; but the boundaries are only marked here and there, and it becomes more difficult to define them every day. The amalgamation of all these interests in a company which aims at increasing natural knowledge, represents in a way the relation between the separate

sciences and physiography conceived in the widest spirit. Perhaps a philosopher will one day arise and produce from the discrete collections of scientific facts a structure in which all available material shall be fitted into its true place; and the monument thus erected should be called physiography. Or, using another simile, what is wanted is a Darwin who will trace the complete development of organic and inorganic sciences, and show the mutual relations between the stores of knowledge at present kept in different departments. The work in which this is done will be a work on physiography.

The complete co-ordination of scientific material can, however, only become possible when omniscience is reached; what the apostles of physiography have now to do is to preach the gospel of the study of all natural knowledge. He who limits the study to the causes and consequences of the various forms of the earth's surface is not concerned with physiography at all, but with physical geography. As was pointed out by Sir Norman Lockyer long ago, in passing from geography to physiography, we pass from *γη* to *φύσις*, from the earth to the universe, and unless that is borne in mind the view of physiography is restricted and unnatural. Considered in this light, the physiography of South Kensington examinations presents characteristics worthy of consideration. The subject includes the main fundamental principles of observational science, and the application of these principles to the study of the earth, the sun, moon, stars and other bodies in the universe. The physical environment of man is not considered as such, and though prominence is given to the earth's crust and the changes which take place in it, the point of view is largely physical, and physical causes rather than anthropomorphic consequences are included.

It will thus be seen that there is no pretence to make the physiography of South Kensington the field of physical geography, whether the latter expression is taken to mean the subject as conceived by the geographers of a former generation, or whether it is given the interpretation Prof. Davis puts upon it. It is of course open to any one to criticise the syllabus; but the point of view should be as much that of the physicist as of the geographer. And whatever is said, let it be borne in mind that the syllabus is the only one existing in this country to encourage the experimental study of the physical principles underlying astronomy, earth-knowledge, and meteorology. Whether it would be better, in view of the meaning attached to the word physiography in the United States, for the South Kensington examiners to discontinue their use of the term, and divide the subject into two, under the titles of physical geography and astronomy, must be left to the proper authorities to decide.

R. A. G.

NOTES.

WE learn from the *Times* that on Saturday last Prof. Slaby, of the Charlottenburg Technical High School, gave an interesting lecture before the Emperor of Germany and a distinguished company upon improvements which his former assistant, Count Arco, and himself have made in the art of wireless telegraphy. It has not hitherto been possible to use wireless telegraphy for communicating with several different stations at the same time. Prof. Slaby has now succeeded in overcoming this difficulty, and on Saturday night he communicated from the conference room of the General Electric Company in Berlin with operators in the laboratory of the Technical High School at Charlottenburg and in the works of the General Electric Company at Ober Schönweide. These two stations are distant about two and eight miles respectively from the conference room in which the experiment was conducted. Prof. Slaby used two instruments, both of which were connected with a lightning conductor in the neighbourhood. One of the instruments was made to syntonise exactly with that in the laboratory at Charlottenburg, the other

with the instrument in the works at Ober Schönweide. The experiment was a great success, especially in view of the fact that the greater part of Berlin separated the conference room from one of the stations with which messages were exchanged. The German Emperor displayed the greatest interest in the experiments, and afterwards conversed for some time with Prof. Slaby and Count Arco.

WE much regret to announce that Lord Armstrong, F.R.S., died this morning (December 27), at his seat, Crag-side, Rothbury, Northumberland.

LORD KELVIN, Master of the Clothworkers' Company, has accepted an invitation to dine with the governors of the Yorkshire College on February 1, on the occasion of their annual gathering at Leeds. He is expected to deliver an address on textile industries.

IN answer to Lady Warwick's appeal for a millionaire to continue and develop the work of her Women's Agricultural College at Reading, a wealthy gentleman has since come forward with an offer of 50,000*l.* for the hostel.

PROF. F. E. NIPHER, of Washington University, Saint Louis, Missouri, announces that, after many months of failure, he has succeeded in developing a fine reversed photographic picture with the developing bath fully exposed to direct sunlight. The operation lasted a full half-hour, with no trace of fog. The developer was a modification of the hydrochinone, the formula for which is given in every box of "Cramer" plates. The bromide was left out, and the sodium carbonate solution was made up at half the strength used for negatives. The mixed developer was diluted with water in the proportion of one part to nine.

MR. W. ERNEST COOKE, Government Astronomer of Western Australia, sends us an account of observations of November meteors, made by Mr. W. C. Best near Newcastle (W.A.), on November 10, at about 9.30 p.m. Mr. Best says:—"The meteors appeared to come from a north-easterly direction and went toward the north. They all seemed to come from one point and spread out as they travelled, each one leaving a streak of light to mark its course. From the point where they started to where they disappeared seemed about 5° or 6°. The display lasted about 30 secs., during which time I saw from 100 to 200 stars shoot."

MR. SOWERBY WALLIS, who was for nearly thirty years associated with the late Mr. G. J. Symons, F.R.S., and has since the latter's death carried on the British Rainfall Organisation, will, from the beginning of next year, be joined in the work by Dr. H. R. Mill, who has resigned the librarianship of the Royal Geographical Society for that purpose.

THE Paris correspondent of the *Chemist and Druggist* states that at the Paris Natural History Museum a laboratory has recently been opened for biological studies applied to the French colonies. The work of the new laboratory will be to reply to inquiries relating to biology, geology and mineralogy, and to prepare precise instructions for foreign correspondents regarding the rearing of animals and cultivation of plants in the respective countries.

OUR attention has been directed to the following surprising announcement, made by the Peking correspondent of the *Times*: "In pursuance of their regrettable policy of appropriation, the French and German generals, with Count von Waldersee's approval, have removed from the wall of Peking the superb astronomical instruments, erected two centuries ago by the Jesuit fathers. Half of them will go to Berlin and the rest to Paris. The explanation of this act of vandalism is that, inasmuch as the return of the Court is so improbable, such beautiful instruments should not be exposed to the possibilities of injury when Peking is no longer the capital."

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AN exhibition of photographs by Mr. F. M. Sutcliffe, of Whitby, will be opened on Wednesday next, January 2, in the rooms of the Royal Photographic Society. Admission can be obtained on the presentation of a visiting card.

A NEW meteorological observatory was opened at Aachen (Aix-la-Chapelle) in September last and placed under the superintendence of Dr. P. Polis. From all points of view this establishment is well fitted for carrying on, not only the usual climatological observations, but various researches in atmospheric physics. The last volume of the observations has just been published, for the year 1899, and contains the records for six subsidiary stations, in addition to the records of about thirty rainfall stations, and several valuable discussions, including one on the climate of Aachen. Observations were first commenced in the year 1838 by Dr. Heis, and since 1873 the observatory has formed one of the official stations of the German network. Dr. Polis is a constant contributor to meteorological science in various German periodicals, and we congratulate him upon the establishment of his new observatory and the means now at his disposal for increased usefulness.

THE recent attempts to disperse hail storms by the firing of cannon or mortars, and the suggestion that vortex rings projected by the explosion may be the actual cause which disturbs the storm-cloud, have led Dr. G. Vicentini and Dr. G. Pacher to carry out a series of experiments on the velocity of these so-called "gaseous projectiles." The general conclusions agree with those of Pernter and Trabert, according to which the velocity of these vortices is much smaller than was supposed in the earlier investigations, and this velocity gradually decreases in consequence of viscosity. The authors find that in experiments on a small scale, pistols with a conical barrel give the best results. Some interesting laboratory experiments are described in which a small smoke ring was projected against a target formed of a thin capillary liquid film stretched on a circular frame. The different effects observed, according to the energy of the vortex, include the following: (1) the film bulges out, but returns to its original position, the vortex being arrested; (2) the ring destroys the film and proceeds on its way with diminished velocity; (3) the film is destroyed and the vortex, including most of the smoke, is imprisoned in a bubble which soon falls to the ground; (4) the vortex is imprisoned in a bubble, but the film behind returns to its original position; (5) the bubble which imprisons the vortex remains attached to the film and slowly sinks; (6) the film is destroyed, but the bubble rebounds in the opposite direction to that in which the vortex was projected. These experiments and observations are described in the *Atti del R. Istituto Veneto*, lix. lx.

THE much debated doctrine of partition of energy among the molecules of a gas is once more attacked by Mr. Burbury in the *Philosophical Magazine* for December. The paper consists mainly of an examination of the proofs of the law of equal partition, based on the two alternative methods of Maxwell and Lord Rayleigh, and of Boltzmann respectively, and the conclusions enunciated by Mr. Burbury are as follows: (1) The law of equal partition of energy among the translation velocities is not proved by the Maxwell-Rayleigh method; (2) It is not proved by Boltzmann's method, because the fundamental assumption on which that method is based is not proved; (3) Subject to any proof that may be given hereafter of Boltzmann's assumption, which, however, Mr. Burbury thinks can be disproved, the law is not generally true in any sense whatever. When, however, the density is very small, the mean translational kinetic energies of two molecules of unequal mass will differ only by small quantities of the second order. The law may, therefore, be asserted for the limiting case of an infinitely rare gas.

THE results of a new investigation of the anomalous dispersion of cyanin have recently been published by Dr. C. E. Magnusson in No. 41 of the *Bulletin* of the University of Wisconsin. An attempt has been made to determine the refractive indices throughout the whole spectrum, including the region of the absorption bands, by four distinct methods: (a) Direct spectrometer readings in the visible spectrum using solid prisms, the slit being illuminated with monochromatic light produced by an auxiliary spectroscopy; (b) photographic records of the deviation of a system of monochromatic rays from a Rowland concave grating illuminated by an iron arc; (c) a qualitative method, using crossed prisms, and recording the results photographically; (d) photographic records of the displacement of the fringes in the Michelson interferometer produced by thin films of cyanin, prepared by dipping plates of glass in alcoholic solutions. To obtain good prisms by Prof. Wood's method, Dr. Magnusson finds that the substance must be heated rapidly, the prism formed and cooled quickly, and at the right temperature; if too cool, the fused mass cannot be pressed between the plates of glass to the required thinness, and if too hot, bubbles make their appearance. The general accordance of the values obtained by the different methods employed results in a fairly accurate dispersion curve for cyanin from the extreme red well into the ultra-violet, and the work with the interferometer gives conclusive evidence of the continuity of the curve through the absorption band in the yellow. It was originally intended to test the Ketteler-Helmholtz dispersion formula for the ultra-violet and extreme red rays, where Pflüger's investigations showed discrepancies. In the case of the ultra-violet it was suggested that the discrepancy might be due to an absorption band, and Dr. Magnusson considers that he has demonstrated the existence of such a band. Until further extensive observations have been made, however, he does not consider a comparison of the new values with the formula likely to be of much service. The results are illustrated graphically, and numerous photographs are reproduced.

AT a meeting of the Anthropological Institute on December 11, Mr. J. W. Crowfoot read a paper on the Bektashis of Cappadocia. Scattered about Turkey in Asia and Persia are many peculiar religious sects, either professing heretical forms of Islam or purely pagan in character, and in both cases hated and persecuted by the orthodox. It has been supposed that the adherents to these sects represent the earliest known inhabitants of the land, and that their religious rites contain relics that go back far beyond the rise of either Mohammedanism or Christianity. With the object of testing this theory, Mr. Crowfoot visited last summer some villages close to the ancient Halys in the Eastern half of Asia minor, occupied by a sect called the Bektash or Kizilbash. Measurements and photographs were taken which corroborate the theory above stated, though evidence was also found of an influx of some more eastern element, driven westwards, probably, at the time of the great Mongol invasions. These people are nominally worshippers of Ali, but in reality the worship of "heroes," from whom they profess descent, plays the greatest rôle in their religion. In one village there was a sacred well strongly impregnated with sulphur, and the fumes of this were inhaled by a prophetess who lived there until she fell into an ecstatic condition, in which she used to give answers to the many inquirers who resorted there, either to learn the future or to be cured by the "hero." Other survivals of a similar character were described. Some native weapons from the south-west of Lake Tanganyika, lent by Dr. Felkin, were also exhibited and described at the same meeting.

DR. J. BEARD has sent us a copy of his paper on the morphological continuity of the germ-cells in *Raia batis*, which appeared in the *Anatomischer Anzeiger*, vol. xviii. nos. 20 and

21. Germ-cells appear to be unicellular organisms, passing one stage of their existence within a multicellular sterilised stock, the embryo, which is formed by one of them at a definite period.

MR. E. S. SHRUBSOLE, the curator of the newly-formed Natural History Department at the Crystal Palace, sends us an announcement of the ten "tableaux" of mounted animals he has prepared for exhibition. They are stated to include 15,000 specimens. We are not at present aware of the manner in which they are arranged, but if they are not grouped according to their place of origin, a grand opportunity of familiarising the public with the leading features in geographical distribution will have been thrown away.

WE have received a copy of a memoir by Dr. S. J. Hickson on the Alcyonaria and Hydrocorallinæ of the Cape of Good Hope, published by the Department of Agriculture of the Cape in the series entitled "Marine Investigations in South Africa." Four new species of Alcyonarians are described; but of more importance are certain new investigations the author has been enabled to 'make into the anatomy of the group, owing to the excellent state of preservation in which the collection was sent to England. As these investigations are not yet completed, the author has published only the systematic work.

RICKETTS in monkeys that have died in captivity forms the subject of a memoir by Signor A. Monti, published in the *Memorie* of the Royal Institute of Lombardy (vol. xix., part 3). The author proposes to defer the discussion of the bearing of his observations on zoology to a future occasion; but he claims for them great importance in regard to certain human diseases. For one thing, they definitely controvert the theory advanced by M. Parrot that ricketts in the human species is due to hereditary syphilis.

PHYSIOLOGICAL and pathological heredity in man forms the subject of Dr. T. Oliver's introductory lecture to a course of clinical medicine delivered in the Royal Infirmary at Newcastle-on-Tyne on October 31, a copy of which we have received from the *Lancet* office. The lecturer takes as his example of heredity the modern racehorse, and states that while none but thoroughbreds have won the Derby, no gelding has ever been first past the winning post, and that in all high-class races mares are much less frequently successful than stallions, although it should be added that they are less frequently entered. In one part of his discourse, Dr. Oliver touches upon the question of "telegony," which, in spite of the Penycuik experiments, he appears to think may not be a myth.

FROM Mr. G. E. H. Barrett-Hamilton we have received copies of five papers, four of which deal with local variation in European species of mammals. With one exception (from the *Annals of Natural History*) these latter are taken from the *Proceedings* of the Zoological Society. The species dealt with are the mountain or variable hare, the wood-mouse, weasel, hedgehog, and dormice. Of the first of these no less than eighteen local races are recognised, several being described for the first time. In districts where it normally turns white in winter the weasel is regarded as subspecifically distinct from the form which remains brown at all seasons. The fifth paper received from Mr. Hamilton is from the *Ibis*, and deals with the birds observed by him in Kamschatka in 1896 and 1897. The most important paragraphs in this communication are those dealing with colour and migration.

THE greater portion of the December issue of the *Zoologist* is taken up with a discussion on conscious protective resemblance in animals. Mr. G. A. K. Marshall commences the discussion with criticisms on Mr. Distant's articles on mimicry which appeared some time ago in the same journal. First of all he expresses the opinion that the term "mimicry" should be

restricted to resemblances assumed for the purpose of attracting attention; resemblances for the purpose of concealment being denoted by the terms protective and aggressive resemblance. He then proceeds to inquire whether any of such resemblances can be rightly termed conscious, concluding that the only instance which affords anything like proof of consciousness is one narrated by Mr. E. Thompson concerning the actions of a fox. But even if this be a true instance, the fox is such an abnormally clever animal that the case does not affect other supposed examples; and it is concluded that "there are good grounds for opposing the suggestion that active mimicry is of any general occurrence in the animal kingdom." Prof. E. B. Poulton continues the discussion in the form of notes, in which he gives a general support to the views of Mr. Marshall. Incidentally he mentions that the posture usually given to the leaf-butterfly (*Callima*) is incorrect. Mr. Distant adds a few remarks in defence of his own views, stating that the questions at issue are largely matters of opinion.

We have received the first part of a new work by Prof. Der Vries, of Amsterdam, entitled "*Die Mutations Theorie*." It deals with the origin of new species; and these the author considers to arise solely as the result of sudden sporting, or of discontinuous variation. He does not regard the ordinary variation usually to be observed amongst the individuals of any given race as contributing towards the evolution of new species, but looks upon them as the transient and easily reversible expression of altered circumstances of life. The latter part of the book is occupied with an account of his observations on the "mutations" exhibited by *Oenothera Lamarckiana*, and he claims to have secured a number of discontinuously produced forms which retain their character in successive generations, and which show no tendency towards reversal, nor to the production of forms intermediate between themselves and the parent stock. Even if one does not feel inclined to accept all the author's conclusions, and even if lurking doubts as to the actual purity of the original strain of his *Oenothera* obtrude themselves on the mind of the reader, the book is worth a perusal for the sake of the lucid manner with which the arguments and facts are brought forward, and (sometimes) constrained to give support to the views therein advocated. It would be, however, premature to discuss the theory as a whole until the completion of the book enables one to form a mature estimate of its real value.

THE November *Journal* of the Royal Horticultural Society provides students of botany and others interested in problems of evolution with plenty of material for thought. Among the subjects dealt with in papers are the evolution of plants illustrated by the cultivated nature of gardens, by Mr. R. I. Lynch; problems of heredity as a subject for horticultural investigation, by Mr. W. Bateson, F.R.S.; aquatic plants, by Prof. G. S. Boulger; protoplasm, the instrument of evolution among plants, by the Rev. G. Henslow, who also contributes several instructive papers on plant structure and growth; the strawberry and gooseberry mildews, by Mr. E. S. Salmon, and descriptions of new plants exhibited at the meetings of the Society. Every one concerned with the science or the art of gardening will find in the *Journal* much suggestive and interesting information.

As a handy compendium of biographical particulars referring to men and women whose names are known in the worlds of literature, art or science, or who are distinguished in other ways, "Who's Who?" now stands alone, for with the 1901 edition, which Messrs. A. and C. Black have just published, is incorporated "Men and Women of the Time." The annual is a good index to the works, recreations and careers of practically every one alive whose influence upon human progress is recognised. All the living Fellows of the Royal Society appear to be included among the biographies, as well as numerous members of other scientific societies. The information tabu-

lated before the biographies includes lists of abbreviations; peculiarly-pronounced proper names, the names and addresses of the chief newspapers and magazines, pseudonyms and pen-names, Fellows of the Royal Society, names, addresses and conditions of admission to scientific and other learned societies, chairs and professors in the universities, university degrees, and other matters of general interest. In the abbreviations we notice "anat.," signifying anatomy or anatomical, and "bot." for botany; but it is not easy to understand why these should be given, while other conventional abridgments, such as "math." for mathematics, "astr." for astronomy, "mech." for mechanics, "mag." for magnetism or magazine, "phys." for physical, "soc." for society, and "phil." for philosophical, are not explained. Either "anat." and "bot." should be omitted or others in just as common use should be inserted. The principle which has led to the selection of other abbreviations is also not clear. We find A.K.C. signifying Associate of King's College, and K.C. for King's College; but we do not see A.R.C.S. for Associate of the Royal College of Science, or U.C. for University College. B. Eng. is given for Bachelor of Engineering, but B.E. is the form usually adopted. D.Sc. is given, but not Sc.D.; and M.I.M.E. (Member of the Institution of Mechanical Engineers) is also omitted, while fellowship of the unrecognised Society of Science and Art is dignified by F.S.Sc.A. In the next edition the professors in the universities of London and Birmingham ought to be added to the list of those occupying chairs in the older universities.

THE additions to the Zoological Society's Gardens during the past week include a Cuvier's Gazelle (*Gazella Cuvieri*) from Algeria, presented by Mr. B. T. Barneby; a Golden Eagle (*Aquila chrysaetos*) from Scotland, presented by Mr. H. E. Bury; a Rose Hill Parrakeet (*Platycercus eximius*) from Australia, presented by Mrs. Stoughton; a Burmese Tortoise (*Testudo elongata*) from Burmah, presented by Captain A. Ram; a Slow Loris (*Nycticebus tardigradus*) from the Malay Peninsula, three Ring-tailed Coatis (*Nasua rufa*) from South America, a Maximilian Parrot (*Pionus maximiliana*) from Brazil, two Lettered Aracaris (*Pteroglossus inscriptus*) from Para, two Adelaide Parrakeets (*Platycercus adalaidae*), four Plumed Ground Doves (*Geophaps plumifera*) from Australia, two Common Cassowaries (*Casuarus galeatus*) from Ceram, an Ural Owl (*Syrnium uralensis*), a Passerine Owl (*Glauucidium passerinum*), European, five Chestnut-bellied Finches (*Munia rubro-nigra*), six Bungoma River Turtles (*Emyda granosa*), a Roofed Terrapin (*Kachuga tectum*) from India, two Leopard Tortoises (*Testudo pardalis*) from South Africa, a South Albemarle Tortoise (*Testudo vicina*) from South Albemarle Island, three Wrinkled Terrapins (*Chrysemys scripta rugosa*) from the West Indies, a Muhlenberg's Terrapin (*Clemmys muhlenbergi*) from North America, an European Pond Tortoise (*Emys orbicularis*), European, deposited.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES IN JANUARY, 1901.

- Jan. 2-3. Epoch of the January meteors (Radiant $230^{\circ} + 53^{\circ}$).
3. 9h. Venus in conjunction with Neptune. Venus $1^{\circ} 10' N$.
 3. 11h. 7m. Minimum of Algol (8 Persei).
 5. 9h. 45m. to 10h. 50m. Moon occults 1 Cancri (mag. 5.9).
 6. 6h. 36m. to 7h. 31m. Moon occults A¹ Cancri, (mag. 5.6).
 6. 7h. 56m. Minimum of Algol (8 Persei).
 6. 13h. 48m. to 15h. 4m. Moon occults 60 Cancri, (mag. 5.7).
 9. 4h. 45m. Minimum of Algol (8 Persei).
 15. 9h. Venus in conjunction with Jupiter. Venus $0^{\circ} 22' N$.